



**Natural Resources Conservation Service**  
**CONSERVATION PRACTICE STANDARD**  
**ENERGY EFFICIENT AGRICULTURAL OPERATION**  
**CODE 374**  
**(no)**

**DEFINITION**

On-farm facilities, equipment, and management strategies that provide increased energy efficiency.

**PURPOSE**

This practice is used to accomplish the following purpose:

- Improve energy efficiency for facilities, equipment, and/or processes.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to nonresidential structures, equipment, and other energy-using systems that support agricultural production and related enterprises except where another NRCS Conservation Practice Standard (CPS) is more appropriate.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Implement energy improvements of the equipment or facility to meet the intended purposes for each area, space, or function.

Provide analyses to demonstrate energy efficiency for each improvement.

Design replacement or retrofit systems and related components or devices to meet or exceed currently applicable Federal, State, and local standards and guidelines. Design in accordance with sound engineering principles and industry standards. When installing additional devices, adding circuits, or modifying wiring for electrical systems, meet National Fire Protection Association (NFPA) 70, "National Electrical Code," including Article 547, "Agricultural Buildings," as well as applicable State and local codes.

Follow manufacturer's instructions and guidelines when designing, installing, and initiating startup of equipment and systems. Use certified installers when required by the manufacturer.

**Utilities and permits**

The land owner is responsible for obtaining all permits and ensuring the location of all buried utilities, drainage tile, and other structural measures in the project area prior to the start of construction.

**Heat transfer control**

For energy efficiency improvements that support heating, ventilating, air conditioning, and refrigeration (HVAC&R), meet the criteria in NRCS CPS Energy Efficient Building Envelope (Code 672) for air leakage, insulation, energy screens, and livestock curtains for all enclosed structures or areas within buildings.

### **Prescriptive upgrades**

Equipment and system upgrades included on the State-approved prescriptive list have been shown to improve energy efficiency and conform to relevant practice criteria. As such, design and implementation do not require additional specific analysis of energy efficiency performance parameters.

For energy efficiency upgrades not included on the State-approved prescriptive list, utilize the criteria below.

### **Additional Criteria for HVAC&R**

#### **Heating**

Where heating systems use fuel oil, propane, and other fossil fuel combustion technology, select equipment that meets or exceeds the listed efficiency ratings below.

- Hydronic boilers, unit heaters, or other systems not otherwise identified.—Use steady-state combustion efficiencies of 90 percent or more.
- Steamboilers.—Use steady-state combustion efficiency of 82 percent or more.
- Radiant.—Select radiant heaters certified per ANSI Z83.19, “Gas-Fired High-Intensity Infrared Heaters” or ANSI Z83.20, “Gas-Fired Tubular and Low-Intensity Infrared Heaters.” Use radiant efficiency (radiant coefficient) of 35 percent or more when tested according to:
  - The American National Standards Institute (ANSI) 1330, “Performance Rating for Radiant Output of Gas Fired Infrared Heaters,” or
  - British Standard Institute BS EN 416, “Gas-fired overhead radiant tube heaters and radiant tube heater systems for non-domestic use. Safety and energy efficiency” (low-intensity), or
  - BS EN 419 “Gas-fired overhead luminous radiant heaters for non-domestic use. Safety and energy efficiency” (high-intensity).

#### **Ventilation**

Select fans from those included within the most energy efficient quartile of fans that satisfy required levels of service parameters (air flow, static pressure, etc.) tested by the Bioenvironmental and Structural System Laboratory (BESS Labs). Assess fan energy efficiency on volumetric efficiency ratio with typical units of measure rendered as: cubic feet per minute per watt (CFM/W), cubic feet per minute per horsepower (CFM/HP), or pound-force per watt (Lbf/W).

#### **Refrigeration**

Select cooling equipment that meet or exceed an energy efficiency ratio (EER) of 10.5 (Btu/h)/W.

### **CONSIDERATIONS**

The benefits of energy conservation upgrades may be reduced if equipment and systems are unable to meet level of service requirements. Energy benefits may be compromised due to increased run-times, decreased useful life, the addition of less efficient equipment to compensate, or other actions.

### **PLANS AND SPECIFICATIONS**

Prepare plans and specifications to meet the requirements of this standard. As a minimum, include—

- Site-specific installation details.
- Identification and description of the existing system and related components or devices to be replaced.
- Actions for proper disposal of any components to be removed.
- Location of the measures in relationship to other structures or natural features, where appropriate, in a plan view.
- Detailed drawings of the measures and appurtenances, such as piping, inlet and outlet

connections, mounting, foundations, and other structural components, where appropriate.

## **OPERATION AND MAINTENANCE**

Prepare a site-specific operation and maintenance plan that is consistent with the purposes of the equipment, facility, or processes; its intended life; and safety requirements. Utilize manufacturer's recommendations to the extent practicable. At a minimum, include—

- Startup procedures per manufacturer's written instructions.
- Items in need of periodic inspections (e.g., components, equipment, wiring, and controls).
- Components that are subject to routine replacement to ensure proper function.
- Appropriate service intervals and maintenance tasks to ensure expected useful life of the equipment.

## **REFERENCES**

National Fire Protection Association. 2017. NFPA 70, National Electric Code. Boston, MA.

American National Standards Institute. 2017. ANSI Z83.19/CSA 2.35, Gas-Fired High-Intensity Infrared Heaters. Washington, DC.

American National Standards Institute. 2020. ANSI Z83.20/CSA 2.34, Gas-Fired Tubular and Low-Intensity Infrared Heaters. Washington, DC.

American National Standards Institute. 2015. CAN/ANSI/AHRI 1330, Performance Rating for Radiant Output of Gas Fired Infrared Heaters, Washington, DC.

British Standard Institute. 2019. BS EN 416, Gas-fired overhead radiant tube heaters and radiant tube heater systems for non-domestic use. Safety and energy efficiency. London, UK

British Standard Institute. 2019. BS EN 419, Gas-fired overhead luminous radiant heaters for non-domestic use. Safety and energy efficiency. London, UK

Bioenvironmental and Structural Systems Laboratory, Department of Agricultural and Biological Engineering, The University of Illinois at Urbana-Champaign. 2019. <http://bess.illinois.edu/>, Agricultural Ventilation Fans Performance and Efficiencies. Urbana, IL.

